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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/835,820	04/17/2001	Tomohisa Hoshino	P 280192 EL00028CDC	5539

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EXAMINER

LUU, CHUONG A

ART UNIT

PAPER NUMBER

2825

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/835,820

Applicant(s)

HOSHINO ET AL.

Examiner

Chuong A Luu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

The indicated allowability of claims 8-14 is withdrawn in view of the newly discovered reference(s) to Hausmann et al. (U.S. 6,475,902 B1). Rejections based on the newly cited reference(s) follow.

Inventorship

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

PRIOR ART REJECTION

Statutory Basis

Claim Rejections - 35 USC § 102

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The Rejections

Claims 1-2, 4, 6-9, 11 and 13-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Hausmann et al. (U.S. 6,475,902 B1).

Hausmann discloses a method of depositing a metal nitride material with

(1) forming a barrier layer (119) on an insulating film (114) covering a substrate (112) (see Figure 1);

exposing the barrier layer to a first gas atmosphere containing a reducing gas at an elevated substrate temperature (see column 9, lines 46-65);

forming, after said step of exposing said barrier conductor layer to said first gas atmosphere, a metal film (120) on the barrier conductor layer by a CVD process (see column 10, lines 39-50);

exposing said metal film (120) to a second gas atmosphere at an elevated substrate temperature (see column 10, lines 39-67; column 11, lines 1-26);

(2) wherein said first reducing gas atmosphere is selected from any of the group consisting of silane, ammonia and hydrogen (see columns 8 and 9, lines 27-67 and lines 1-46, respectively)

(4) wherein said second gas atmosphere includes hydrogen and/or nitrogen (see column 10, lines 39-67; column 11, lines 1-26);

(7) wherein said barrier conductor layer is formed of any of Ta or TaN (see column 9, lines 33-46);

(8) forming a barrier conductor layer (119) of any of tungsten nitride or tantalum nitride on a substrate (see column 9, lines 33-46);

exposing said barrier conductor layer (119) to a plasma of a reducing gas at an elevated temperature (see column 9, lines 46-65);

forming, after said step of exposing said barrier conductor layer to said plasma, a metal film (120) on said barrier conductor layer by a CVD process (see column 10, lines 39-50);

(9) wherein said reducing gas is hydrogen (see column 9, lines 46-65);

(11) further comprising, after said step of forming said metal film, a thermal annealing process applied to said metal film (see column 10, lines 39-62);

(6); (13) wherein said metal film is formed of Cu (see column 10, lines 39-42);

(14) alternately and repeatedly forming, on a substrate, an insulating film, a barrier conductor layer, wherein a step of exposing said barrier conductor film to a plasma of a reducing gas at an elevated temperature is interposed between said step of forming said barrier conductor layer and said step of forming said metal film (see columns 6, 9 and 10, lines 44-61, lines 33-67 and lines 39-67, respectively);

(15) wherein said step of forming said barrier conductor layer is conducted by a PVD process (see column 6, lines 44-67);

(16) wherein said second gas atmosphere includes nitrogen (see column 10, lines 39-67; column 11, lines 1-26).

Claims 3, 5, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hausmann et al. (U.S. 6,475,902 B1).

Hausmann discloses the above outlined features except for wherein said step of exposing said barrier conductor layer to said plasma is conducted at a temperature of 50-400°C; wherein said thermal annealing process is conducted at a temperature of 250-500°C. Although, Hausmann does not describe specific operating temperatures as recited in the present applicant, Hausmann clearly suggests the specific operating temperatures which can vary according to the operational requirement (see column 9, lines 50-64). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the teaching of Hausmann by varying the temperature range of operational conditions during fabricating a semiconductor device to exceed its

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performance criteria. In re Aller, 105 USPQ 233 and In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A Luu whose telephone number is (703)305-0129. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703)308-1323. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

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April 24, 2003

C. Auerbach
C. AUERBACH
FEDERAL BUREAU OF INVESTIGATION